- Package Options Include Plastic "Small Outline" Packages, Ceramic Chip Carriers and Flat Packages, and Plastic and Ceramic DIPs
- Dependable Texas Instruments Quality and Reliability

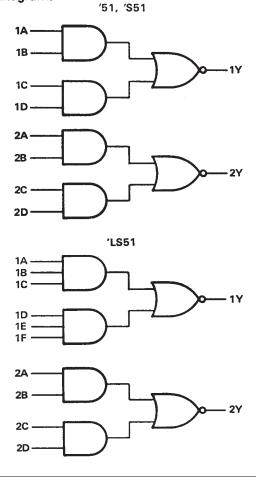
#### description

The '51 and 'S51 contain two independent 2-wide 2-input AND-OR-INVERT gates. They perform the Boolean function  $Y = \overline{AB + CD}$ .

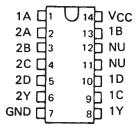
The 'LS51 contains one 2-wide 3-input and one 2-wide 2-input AND-OR-INVERT gates. They perform the Boolean functions  $1Y = \overline{(1A \cdot 1B \cdot 1C) + (1D \cdot 1E \cdot 1F)}$  and  $2Y = \overline{(2A \cdot 2B) + (2C \cdot 2D)}$ .

The SN5451, SN54LS51, and SN54S51 are characterized for operation over the full military temperature range of -55°C to 125°C. The SN7451, SN74LS51 and SN74S51 are characterized for operation from 0°C to 70°C.

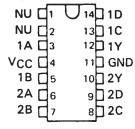
## logic diagrams



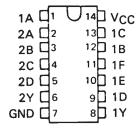
SN5451 . . . J PACKAGE SN54S51 . . . J OR W PACKAGE SN7451 . . . N PACKAGE SN74S51 . . . D OR N PACKAGE (TOP VIEW)



SN5451 . . . W PACKAGE (TOP VIEW)



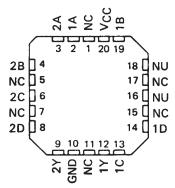
SN54LS51 . . . J OR W PACKAGE SN74LS51 . . . D OR N PACKAGE (TOP VIEW)



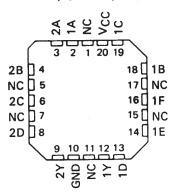
NC- No internal connection
NU - Make no external connection



# SN54S51 . . . FK PACKAGE (TOP VIEW)

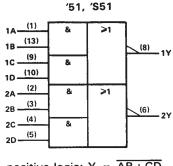


# SN54LS51 . . . FK PACKAGE (TOP VIEW)

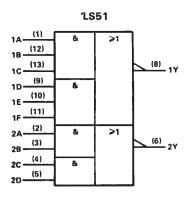


NC - No internal connection
NU - Make no external connection

## logic symbols†



positive logic:  $Y = \overline{AB + CD}$ 

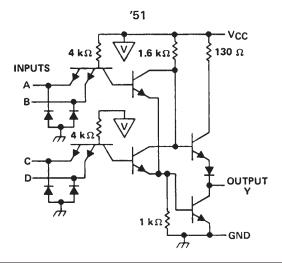


### positive logic:

$$1Y = \overline{(1A \cdot 1B \cdot 1C) + (1D \cdot 1E \cdot 1F)}$$

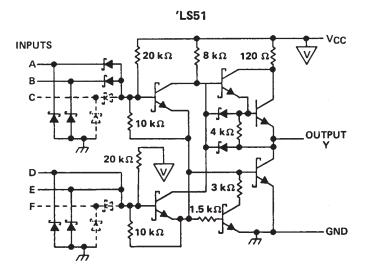
$$2Y = \overline{(2A \cdot 2B) + (2C \cdot 2D)}$$

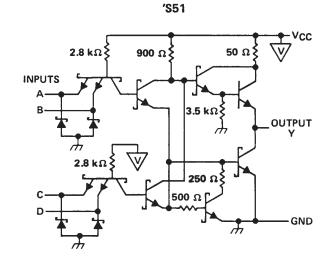
#### schematics





<sup>&</sup>lt;sup>†</sup>These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12. Pin numbers shown are for D, J, N, and W packages.





## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)

Supply voltage, VCC (See Note 1): '	51, 'LS51, 'S51	7 V
Input voltage: '51, 'S51		5.5 V
′LS51		7 V
Operating free-air temperature range	SN54'	-55°C to 125°C
	SN74'	0°C to 70°C
Storage temperature range		-65°C to 150°C

NOTE 1: Voltage values are with respect to network ground terminal.



### recommended operating conditions

			SN5451			UNIT		
		MIN	NOM	MAX	MIN	NOM	MAX	UNII
Vcc	Supply voltage	4.5	5	5.5	4.75	5	5.25	٧
VIH	High-level input voltage	2			2			٧
VIL	Low-level input voltage			0.8			0.8	V
Іон	High-level output current			- 0.4			- 0.4	mA
loL	Low-level output current			16			16	mA
TA	Operating free-air temperature	- 55		125	0		70	°C

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

	TECT CONDITIONS +			SN5451			SN7451			
PARAMETER		TEST CONDITIONS †		MIN	TYP‡	MAX	MIN	TYP‡	MAX	UNIT
VIK	V <sub>CC</sub> = MIN,	I <sub>I</sub> = - 12 mA				- 1.5			- 1.5	٧
Voн	V <sub>CC</sub> = MIN,	V <sub>IL</sub> = 0.8 V,	I <sub>OH</sub> = - 0.4 mA	2.4	3.4		2.4	3.4		٧
VOL	V <sub>CC</sub> = MIN,	V <sub>IH</sub> = 2 V,	I <sub>OL</sub> = 16 mA		0.2	0.4		0.2	0.4	V
lj l	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 5.5 V				1			1	mA
ΊΗ	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 2.4 V				40			40	μΑ
IIL	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 0.4 V				<b>–</b> 1.6			- 1.6	mA
loss	V <sub>CC</sub> = MAX			- 20		- 55	- 18		- 55	mA
1 <sub>CCH</sub>	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 0 V			4	8		4	8	mA
ICCL	V <sub>CC</sub> = MAX,	See Note 2			7.4	14		7.4	14	mA

<sup>†</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 2: All inputs of one AND gate at 4.5 V, all others at GND.

## switching characteristics, V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CON	MIN	TYP	MAX	UNIT	
t <sub>PLH</sub>	A		B 400 O	C <sub>1</sub> = 15 pF		13	22	ns
tPHL	Any	1	R <sub>L</sub> = 400 Ω,	C[ - 15 pr		8	15	115

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



<sup>‡</sup> All typical values are at  $V_{CC}$  = 5 V,  $T_A$  = 25° C. § Not more than one output should be shorted at a time.

#### recommended operating conditions

		S	SN54LS51			SN74LS51			
		MIN	NOM	MAX	MIN	NOM	MAX	UNIT	
Vcc	Supply voltage	4.5	5	5,5	4.75	5	5.25	V	
VIH	High-level input voltage	2			2			٧	
VIL	Low-level input voltage			0.7			8.0	V	
10Н	High-level output current			-0.4			-0.4	mA	
loL	Low-level output current			4			8	mA	
TA	Operating free-air temperature	- 55		125	0		70	°C	

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

545445755	TEST CONDITIONS †		S	N54LS5	51	S	N74LS5	51	UNIT	
PARAMETER		IEST COND	ITTONS T	MIN	TYP ‡	MAX	MIN	TYP‡	MAX	UNIT
VIK	V <sub>CC</sub> = MIN,	I <sub>I</sub> = - 18 mA				<b>– 1.</b> 5			<b>– 1.5</b>	· V
Voн	V <sub>CC</sub> = MIN,	VIL = MAX,	I <sub>OH</sub> = - 0.4 mA	2.5	3.4		2.7	3.4		>
V	V <sub>CC</sub> = MIN,	V <sub>IH</sub> = 2 V,	IOL = 4 mA		0.25	0.4		0.25	0.4	-1 V I
VOL	V <sub>CC</sub> = MIN,	V <sub>IH</sub> = 2 V,	I <sub>OL</sub> = 8 mA					0.35	0.5	
l <sub>1</sub>	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 7 V				0.1			0.1	mA
<sup>1</sup> ІН	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 2.7 V				20			20	μА
IIL.	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 0.4 V				- 0.4			- 0.4	mA
IOS§	V <sub>CC</sub> = MAX			- 20		100	- 20		100	mA
Іссн	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 0 V			8.0	1.6		8.0	1.6	mA
ICCL	V <sub>CC</sub> = MAX,	See Note 2			1,4	2.8		1.4	2.8	mA

<sup>†</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 2: All inputs of one AND gate at 4.5 V, all others at GND.

## switching characteristics, $V_{CC} = 5 \text{ V}$ , $T_A = 25^{\circ}\text{C}$ (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CON	IDITIONS	MIN TYP	MAX	UNIT
tPLH			D 110	C15 pc	12	20	ns
tPHL	Any	Y	R <sub>L</sub> = 2 kΩ,	C <sub>L</sub> = 15 pF	12.5	20	กร

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



<sup>‡</sup> All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25 ^{\circ} \text{C}$ .

<sup>§</sup> Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.

### recommended operating conditions

			SN54S5	1	SN74S51			UNIT
		MIN	NOM	MAX	MIN	NOM	MAX	UNIT
Vcc	Supply voltage	4.5	5	5.5	4.75	5	5.25	V
VIH	High-level input voltage	2			2			V
VIL	Low-level input voltage			8.0			0.8	V
ЮН	High-level output current			1			- 1	mA
loL	Low-level output current			20			20	mA
TA	Operating free-air temperature	- 55		125	0		70	°C

## electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

				;	SN54S51			SN74S51			
PARAMETER		TEST COND	ITIONS †	MIN	TYP ‡	MAX	MIN	TYP‡	MAX	UNIT	
VIK	V <sub>CC</sub> = MIN,	I <sub>I</sub> = - 18 mA				1.2			1.2	V	
Voн	V <sub>CC</sub> = MIN,	V <sub>IL</sub> = 0.8 V,	I <sub>OH</sub> = -1 mA	2.5	3.4		2.7	3.4		V	
VoL	V <sub>CC</sub> = MIN,	V <sub>IH</sub> = 2 V,	I <sub>OL</sub> = 20 mA			0.5			0.5	V	
I <sub>1</sub>	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 5.5 V				1			1	mA	
I <sub>IH</sub>	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 2.7 V				50			50	μΑ	
I <sub>I</sub> L	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 0.5 V				-2			-2	mA	
loss	V <sub>CC</sub> = MAX			- 40		- 100	40		100	mA	
Іссн	V <sub>CC</sub> = MAX,	V <sub>I</sub> = 0 V			8.2	17.8		8.2	17.8	mA	
ICCL	V <sub>CC</sub> = MAX,	See Note 2			13.6	22		13.6	22	mA	

<sup>†</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

NOTE 2: All inputs of one AND gate at 4.5 V, all others at GND.

## switching characteristics, $V_{CC} = 5 \text{ V}$ , $T_A = 25^{\circ}\text{C}$ (see note 3)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONE	TEST CONDITIONS				UNIT
tPLH			D = 290.0	C <sub>1</sub> = 15 pF		3.5	5.5	ns
<sup>t</sup> PHL	_		$R_{L} = 280 \Omega$ ,	C[ - 15 pr		3.5	5.5	ns
<sup>t</sup> PLH	Any	l Y	R₁ = 280 O	C <sub>L</sub> = 50 pF		5		ns
<sup>t</sup> PHL			$R_{L} = 280 \Omega$ ,	OL 00 PI		5.5		ns

NOTE 3: Load circuits and voltage waveforms are shown in Section 1.



<sup>‡</sup> All typical values are at  $V_{CC} = 5 \text{ V}$ ,  $T_A = 25^{\circ}\text{C}$ .

<sup>§</sup> Not more than one output should be shorted at a time, and the duration of the short-circuit should not exceed one second.

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